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THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LVIII.—No. 20. Whole No. 936. | NEW YORK, MONDAY, MAY 15, 1893. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Sixteenth Annual Meeting, Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION, QUINCY, ILLS., April 10, 1893.

The Sixteenth Annual Meeting of the Western Gas Association will be held at Chicago, on the 17th, 18th and 19th days of May.

The Victoria Hotel will be used as the Association's headquarters, while the business sessions will be conducted in Kinsley's Hall, No. 105 Adams street. It will be recalled by many of our members that our meeting of '88 was held at Kinsley's, and that a more admirable assembly room for our purposes could hardly have been chosen.

While, as above indicated, the Victoria Hotel has been designated as headquarters of the Association, yet the great majority of our members will be compelled to seek accommodations elsewhere, as it has been found impossible to secure any one hotel which is able to provide for all in consequence of the great rush of visitors to the Columbian Exposition, at that time expected. However, there need be no fear on the part of our members as regards securing comfortable quarters and at reasonable prices, provided that rooms are engaged in advance. Rooms should be written for by the 1st day of May at the latest, and the writers should request acknowledgments of their applications from the hotel proprietors, so that there may be no possibility of failure in securing accommodations.

The Local Committee of Arrangements for the Chicago meeting consists of the following named gentlemen: Carl D. Bradley (Chairman), Chas. D. Hauk, A. S. Miller, John Stout, C. F. Bryant, F. K. Waugh, P. S. Dickey, S. S. Stratton, F. R. Persons, H. M. Hubbard, H. D. Harper and Chas. V. Newman. From this general committee the following have been appointed as a special committee on hotel accommodations: S. S. Stratton, A. S. Miller and Chas. V. Newman. The members of said special committee have canvassed the situation thoroughly and report that the following hotels have agreed to provide for the number of guests set opposite their respective names, and at prices as here stated:

Victoria.....	50 guests, at	$2.00 to $5.00	per day.
Great Northern...	50 " "	2.00	per day and upwards.
Gore's Hotel.....	50 " "	1.50	" "
McCoy's Hotel...	150 " "	1.50	" "
Saratoga Hotel...	150 " "	1.00	" "

The hotels above named will be conducted on the European plan exclusively.

The Grand Pacific, operated on the American plan, will provide for 50 of our members, upon receipt of three weeks' notice, at prices ranging from $4 per day, upwards.

The Leland, conducted both upon the American and European plans, will accommodate at their regular rates a limited number of guests upon receiving timely notice from the applicants.

The Rossmore, Wabash avenue, between 18th and 19th streets, a new and finely equipped hotel, especially adapted to family requirements, will take care of 100 guests at their regular rates of $3 to $5 per day. The Rossmore is under the management of the Victoria, which would seem to be a guarantee of excellence.

While the following hotels do not guarantee to reserve accommodations for our members upon receipt of applications, yet a limited number can probably secure rooms if the same are booked at once: The Auditorium, Palmer House and Tremont.

When making applications for quarters, members should write directly to the hotel proprietors and not to the committee on hotel accommodations, although if there is any special information desired beyond that stated in this notice, the members of the committee in question will gladly supply the same.

Further information regarding the papers which will be presented and matters pertaining both to the business and social features of the

forthcoming meeting, etc., will be published in subsequent issues of the JOURNAL.

As it is expected that an unusually large number of applications for membership will be made on the occasion of our Sixteenth Annual Meeting, it is advised that the same be filed at an early day with the undersigned. A. W. LITTLETON, Secretary.

QUINCY, ILLS., May 4, 1893.

The regular meeting of the Board of Directors will be held at the Victoria Hotel, at 10 o'clock, A M., Tuesday, May 16th. The members of the Board are: F. M. Doan, J. M. Starr, W. L. Brown, D. Davis, R. R Dickey, James Montgomery, J. T. Lynn, J.W. Dunbar and H. D.Wal bridge. It is hoped that the Directors will all be in attendance at the hour named, for some important matters are likely to come before them.

The business sessions will be commenced at 9:30 A M. sharp, on the morning of Wednesday, May 17, in Kinsley's Hall.

The following papers will be presented at the Chicago meeting:

"Practical Gas Analysis, with Experimental Illustrations," by Mr. O. O. Thwing, St. Louis, Mo.

"On the Best Method of Construction of Oil or Naphtha Tanks for Storage Purposes," by Mr. F. D. Moses, Chicago, Ills.

"The Duties of Gas Companies to their Patrons," by Mr. H. D.Walbridge, Grand Rapids, Mich.

"The Relative Economies of Gas Engines and Electric Motors," by Mr. Jas. R Smedberg, Chicago, Ills.

"Wrinkles," by Mr. Geo. T. Thompson, St. Louis, Mo.

"Residuals; Ideas Concerning Them Suggested by the Present Outlook," by Mr. James Ferrier, Columbus, Ga.

It will be noticed that the paper list has been somewhat shorn from its usual proportions. In explanation of this fact, it was deemed best by your Executive Committee that this should be done, for the reason that the World's Fair is apt to detract from the attendance at the business meetings, and its attractions may possibly prove so strong to a majority of our members that our usual two days' session may be abbreviated to such an extent that there will not be time for the reading and proper consideration of more than the five papers above enumerated.

In reply to inquiries received regarding transportation rates, I would say that in answer to my request to the railway authorities that the customary reduction of rates be granted, I have received word that on this occasion no reduction from the regular fares will be made, other than those which may happen to be in effect at the time from various points to parties in attendance upon the World's Columbian Exposition.

A complimentary banquet will be tendered to the Association at Kinsley's Hall, on the evening of Thursday, May 18th.

For application blanks, copies of by laws and detailed information not embodied in this notice, please apply to the undersigned.

A. W. LITTLETON, Secretary.

American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., April 19, 1893.

To all Members of the Council:

By direction of the President, I hereby give notice that there will be a meeting of the Council of this Association on May 16th, 1893, at 7.30 P. M., at the Victoria Hotel, Chicago, Ills.

Every member of the Council is urgently requested to be present, as the business to be transacted not only includes subjects concerning the October meeting of the Association, and the special features due to the time and place, but also other matters which are of vital importance to the welfare of the Association. Respectfully,

A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THIS WEEK AT CHICAGO.—No sounds respecting any change in the arrangements for the Western's 16th annual have been heard during the week, although such silence is not to be wondered at when one recalls the nicety of finish that marks the plans already prepared. The executives have completed their burdensome task; and more than ordinarily burdensome it was this year. As we have had occasion to remark prior to this, all roads lead to the Metropolis of the West in this year of grace, and as the roads are being largely travelled over, and as Chicago's resources are not absolutely limitless, necessarily those who had to provide in time for the housing and entertainment of many people from afar were put to their best efforts to cause the thing to be suitably disposed. However, troublesome as the task was, the executives and the committees have succeeded admirably, and those who will be present, either as delegates or guests, can but blame themselves if they are put to some confusion through their own failure to follow the suggestions which have been before them for some weeks. It is likely that the business sessions of the Association will be concluded on the first day (Wednesday), even if a night sitting be necessary to clear the calendar; and by this common-sense policy, the members will be free for two days to absorb the wonders of the "White City." The Exhibition will be in measurably good working order by the 17th—not that we mean to say that on that date complete harmony in the exhibits shall prevail—for the "masters and men" are working with a will to do that which should be done. Everything points to a rousing attendance; a promise that we hope will be strikingly fulfilled.

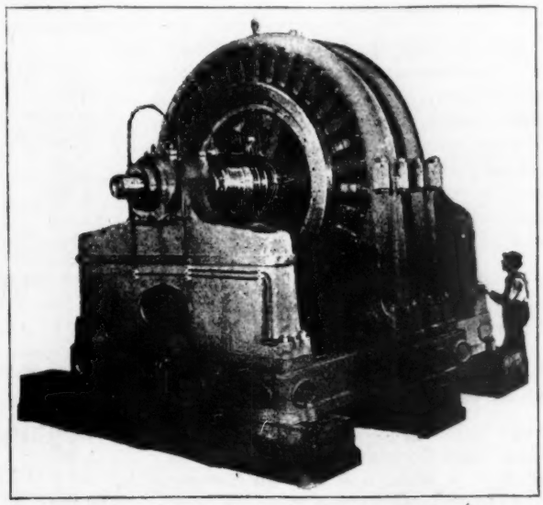
BOOKS RECEIVED.—We are in receipt of a copy of Mr. William Barr's excellent work on "Pumping Machinery," which volume was recently put on the market from the press of the J. B. Lippincott Company, of Philadelphia; and it gives us pleasure to say that the author and his publishers have succeeded admirably in their respective parts in the task. Mr. Barr is known the country over as an expert in the manifold and complex divisions of the subject of pumping machinery and its application; but in the volume now before us he has very sensibly chosen to cause its teachings to be "essentially descriptive of pump detail;" to the exclusion of mixing in the "theory and mathematics of pump construction." The practical man who has to do with pumps and pumping will be largely indebted to Mr. Barr for his logically compiled treatise, which is most profusely illustrated—no less than 264 engravings being employed to point the author's story. To complete its usefulness, we may remark that it carries a very complete index.——Another very useful and seasonable volume is that recently issued at the instance of the United Gas Improvement Company, of Philadelphia. It is a compilation by that well known expert in the art of cooking by gas—Miss Andrews. That clever expounder of the art culinaire in this particular instance prefaces the collection of "Choice Receipts"—of these she cites 250—with a very clear series of hints as to the availibility and cheapness and serviceableness of gas as a fuel, accompanying the same with a well-digested collation of truths as to the best method and means of using gas fuel to secure successful results, in the instance of that which the cook has to do to cause the consumer of her productions to feel that life is worth living. The book, which is copyrighted by the U. G. I. Co., is from the press of the John B. Clarke Company, of Manchester, N. H., who performed their part of the work well.——We are also in receipt of the current catalogue of the Berlin Iron Bridge Company, of East Berlin, Conn., and it is about as complete a volume in the catalogue line as could be prepared. Of course, it is profusely illustrated, and some of the drawings are remarkably handsome specimens of the graving art. On looking it over one cannot fail to be impressed with the varied scope or nature of the Berlin Company's business, and the further fact that not even the limits of the States bound the market to whence its wares go.

NOTES.—In our reading pages will be found two handsome photogravures of the mammoth gasholder constructed and finished last year for the Chicago Gas Light and Coke Company by that go ahead firm of gas apparatus constructors, Messrs. Bartlett. Hayward & Co., of Baltimore. This vessel, which is the largest constructed in America up to the present time, is also noteworthy from the fact that it is the initial example in this country of a 4 lift gasholder. The Chicago Company and the constructors are to be congratulated on their enterprise in making and carrying out this huge undertaking; for that it has answered most admirably (in the face of a most trying winter season, noted for the rigor of its coldness and the violence of its gales) the demands of the Company and sustained the reputation of its builders, is shown by the fact that two similar vessels are now underway for the same Company, under the direction of the same constructing firm. In the face of some of the bosh that we hear of the decadence of the gas business, it might be well to state that at the present time we know of orders in hand, by several gas works apparatus constructors, calling for the erection of holder capacity equal to the storage of 35,000,000 cubic feet per diem.——The World's Fair exhibit of the P. H. & F. M. Roots Company will be in the Department of Mines and Mining, and the Company cordially invites the visiting fraternity to make their headquarters in that section. The exhibit is located in Section "E.," column 25, R., ground, in the Mines and Mining Buildings. The exhibit so far as arranged comprises one No. VI. high pressure blower with vertical engine on same bed plate; one No. II. iron blower; one No. VI. gas exhauster and engine on same bed plate; and one "model slack remover," in operation.

The Incandescent Illumination at the World's Fair.

[By Mr. R. H. Pierce, Chief Electrical Engineer, World's Fair, in *World's Fair Electrical Engineering.*]

It is not the purpose of this brief article to enter into the considerations, financial and otherwise, which led to the adoption of the system of incandescent lighting which is to be used for illuminating the grounds and buildings at Jackson Park; nor to describe in detail the various advantages of the system as planned and installed; but to give the reader an idea of the scope and purpose of the lighting and the general arrangement of the system.



10,000-Light Westinghouse Alternator.

As the visitor enters Machinery Hall by the central entrance upon the north side, he will see before him, at the end of the main aisle and in the center of the power plant, an immense engine belted to two equally immense dynamos. The engine, a quadruple expansion Corliss, drives direct two 10,000 light Westinghouse alternators from one main 30-foot driving pulley. Two 72 inch belts, one over the other, transmit the power to the 9-foot pulleys of the dynamos. Although this engine will not be so conspicuous as to dwarf the surrounding machines, it is, in reality, capable of developing 2,500 horse power, while the big engine at the Centennial was only rated at 1,500 horse power. In adjoining blocks are ten 10,000 light alternating current machines driven by ten 1,000-horse power engines, while two 4,000 light alternators and the necessary exciters are driven by engines of lesser capacity.

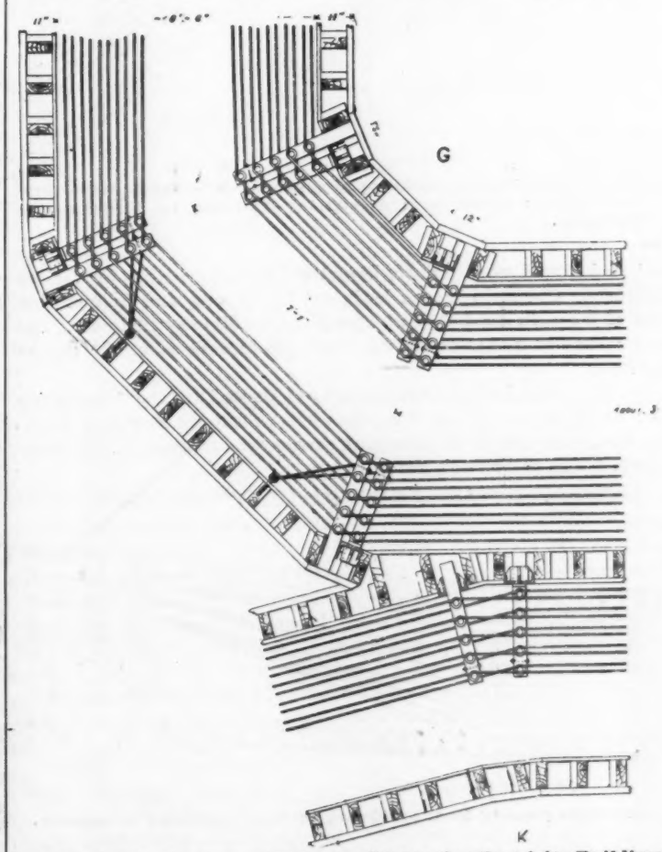
The twelve 10,000 light machines are all of the same pattern and furnish a current of 2,000 volts, which is reduced to 100 volts at the transformers. Each machine carries two 5,000 light armatures upon the same shaft and can be operated as two independent machines, and though rated at 10,000 lights each, these machines have shown after careful testing to possess a capacity of 15,000 lights each of 16 candle power. Thus the total capacity of these 14 Westinghouse machines aggregates 158,000 16-candle power lamps!

This division into blocks and the placing of the machines forms an arrangement which is most admirable, both for convenient operation and for showing both engines and dynamos to the best advantage, and are fully described and illustrated in the January and February numbers of this magazine.

On the south wall of Machinery Hall, facing the big Corliss engine, a 2-storied switchboard, constructed of white marble panels set in an iron framework 76 feet long, has been placed. This switchboard controls all the lights fed from the ten 10,000-light and the two 4,000 light alternators. The board is so arranged that any one of the 48 feeders can, at any time, be thrown on or off any of the 14 dynamos, and with its many highly polished switches, instruments and controlling devices forms a most attractive and interesting exhibit of what is newest and best in central station engineering. To this switchboard are brought the leads from all the dynamos and exciters, the wires being carried from the machines under the floor upon the basement ceiling. The conductors, which are of lead-covered duplex Waring cable, are carried upon iron brackets of special design, and having insulating fiber bushings. From the switch board the feeders, which are also duplex Waring cable, are carried down to the basement, where they are carried across the power plant underground, in vitrified tile duct, into a fireproof room in the basement, in which are placed the lightning arresters for each feeder. Thence the feeders enter the Machinery Hall subway. This subway, which is shut off from the main basement of Machinery Hall by a fire wall, is 8 feet 4 inches in height and 15 feet 8 inches in width, extends under the aisle north of the power plant the entire length of the plant. It contains four series of iron uprights carrying oak cross-arms, and forms a regular pole line construction, with enough insulators in Machinery Hall for carrying 276 wires, allowing but one wire to an insulator. The feeders are carried along this subway, east and west. On the east this subway joins the main subway, which was described in the January number of this magazine. In the main subway the conductors are of rubber-covered wire (Grimshaw), and are carried upon glass petticoat insulators. The subway leads direct to Mines, Electricity, Manufactures, Government and Fisheries Buildings. From the main subway the circuits are led in ducts to the flower beds, the grand basin, to Administration Building and to all the other buildings upon the east side of the Park which are not reached directly by the main subway.

The conductors drawn into the ducts are, in all cases, lead-covered duplex cables. The ducts are of wooden "pump log," having a bore of 2¼ inches, one duplex cable being run to a duct upon the original installation, thus leaving provision for running additional feeders and of strengthening existing feeders should it prove desirable or necessary in the future. The ducts are interrupted by numerous manhole boxes of wood, having cast iron covers, and terminate in converter pits located immediately outside the various buildings.

These pits are of wood, with fire and waterproof linings, and are set so as to extend but 10 inches above finished grade. The size of the pit is varied according to the number of converters it is to contain, the converters in nearly all cases having a capacity of 200 lights each. The converter pits have covers which are so arranged as to keep out all water, and, at the same time, admit of sufficient ventilation to prevent undue heating of converters. These covers can be readily lifted, so that

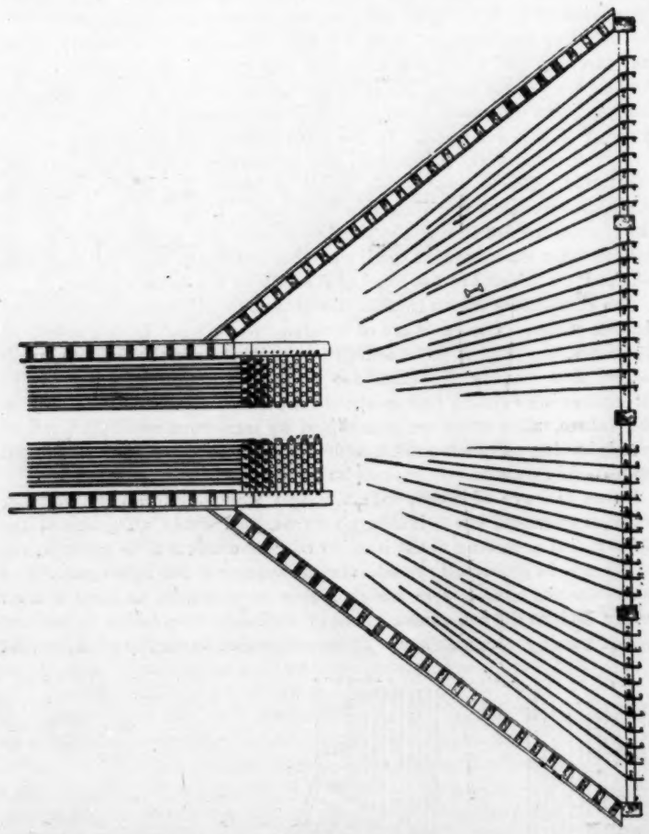


Section of plan of subway "K," extending to the Electricity Building, and "G" to the bridge.

the cut-outs and converters can at any time be inspected, and, if necessary, can be removed or replaced.

From the converter pits, the secondary circuits are led from each converter directly into the buildings through vitrified tile ducts. The circuits running west in the subway under Machinery Hall leave the end of this subway under Machinery annex, and are carried in vitrified tile duct under one of the main aisles to a large manhole box just outside

the north wall of the annex. They are then carried in wooden ducts to a point near the southwest corner of Transportation annex, where they follow the line of the west fence to the northern part of the Park. This "trunk duct line" on the west corresponds to the main subway on the

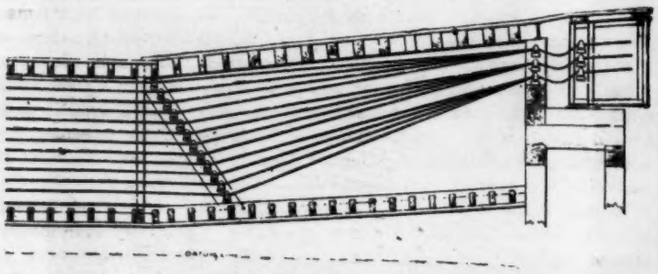


Conductors passing from subway to supports underneath the Bridge, crossing the canal from Electricity Building to Manufactures Building.

east, and from it wooden ducts branch out to converter pits for various buildings. One main branch leads out to the west and follows both sides of the main street the entire length of the Midway Plaisance. The same system of manholes and converter pits prevails as on the east of the Park.

Leading north from the main subway on the east and the "duct trunk line" on the west, a system of wooden ducts runs to the Fine Arts Build ing, and, ramifying in all directions, carries conductors to all the buildings of States and foreign governments.

The main trunk line alone comprises over 76,000 feet of duct, and in



Conductors passing from bridge supports to crossarms in subway.

the whole duct system over 225,000 feet of duct have already been laid. The main subway contains about 25 miles of feeders and the ducts carry over 40 miles of duplex cable. The construction within the buildings varies with the design and purpose of the building, but, in all cases, the installation has been done according to the letter and spirit of the "national code," all conductors being placed so as to be *accessible*. The risers and mains have for the most part been run on insulators, and, in all inside wiring, the wires have been either run on glass knobs or in molding or interior conduit. All wire in buildings is of a high grade of rubber-covered wire, Grimshaw white core being used in all the main Exposition buildings.

The contract with the Westinghouse Electric and Manufacturing Company for incandescent lighting called for the furnishing of dynamo, feeder and converter capacity for 83,410 lamps of 16 candle power, and 6,212 lamps of 10 candle power, or a total of 89,622 lamps; and inside wiring, or wiring to lamps for 50,410 lamps of 16 candle power and 6,212 lamps of 10 candle power, or a total of 56,622 lamps. Following was the estimated distribution of lighting:

Fire Arts Building and annexes	16,242	
Woman's Building	3,000	
Administration Building	5,000	
Music Hall, peristyle and casino	4,368	
Total in buildings to be lighted wholly with incandescent light		28,610
Horticultural	800	
Transportation	2,500	
Mines and mining	3,000	
Machinery and annex	1,000	
Agriculture	4,000	
Manufactures	10,000	
Fisheries	500	
Total for use in main exhibit building		21,800
Decorative lights in flower beds and about grand basin		6,212
Total lights to be wired		56,622

Additional capacity of dynamos, primaries and converters for:

Service Building	1,500	lights.
United States Government Building	5,000	"
Buildings of States and Foreign Governments, and buildings on Midway Plaisance	26,500	"
Total	33,000	lights.

The distribution of these incandescent lights according to their application is as follows:

(1) For use inside buildings lighted wholly with incandescent lights	25,918	lights.
(2) Decorative lights on exterior of buildings	5,442	"
(3) Decorative lights on grounds	6,212	"
(4) Lights in main Exposition buildings for offices, etc., and for use of concessionaires and exhibitors	19,050	"
Total	56,622	lights.

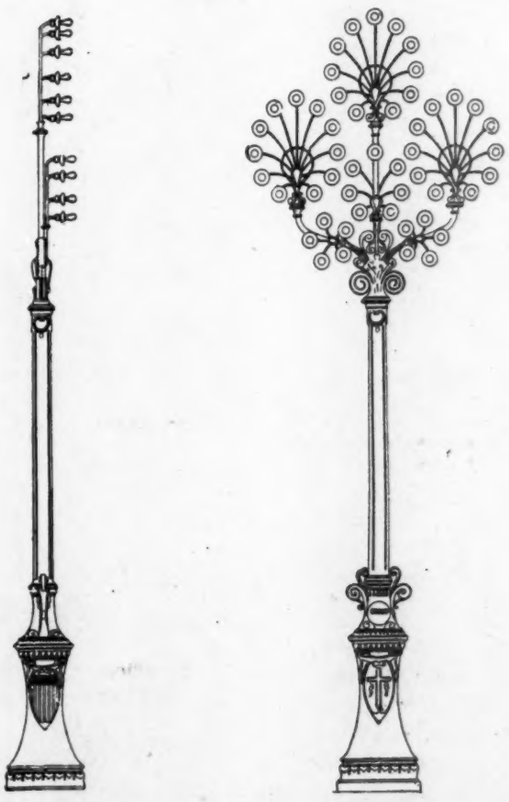
Of these, the lights in buildings to be wholly lighted have been placed substantially as originally laid out.

The decorative lights have been placed as laid out with the exception of but few changes. Since the original estimates were made many new buildings have sprung into existence, and many of the lights for use in main Exposition buildings have been placed for use of the Exposition, but it will be possible with the system of feeders as at present installed, to meet the demand for all incandescent lights that may be desired by exhibitors or concessioniares. The decorative lighting is limited to the outlining of the main lines about the Grand Basin. First, the shore line of the basin is outlined by a row of lights; next, the border of the flower beds is outlined in light; then the main cornice line of the buildings, extending completely around the Grand Basin at a uniform height of about 60 feet, will be marked by a row of lights; and, finally, the Administration Building will be outlined in light, each horizontal line of the architecture, the ribs of the great dome, and, above all, the corona, will be shown in dotted lines of light. Aside from this lighting, the use of incandescent light on exteriors has been confined to the lighting of the Wooded Island and the use of lights here and there to produce a soft glow in colonnades and loggias, and serving, not to attract attention to designs in light, but to bring out to the fullest extent the architectural beauties of the buildings.

The two problems of lighting, by far the most difficult presented, have been the lighting of the Art Galleries, with the two miles of reflecting screens, and the lighting of the dome of the Administration Building, which is larger by far than the dome of the Capitol of Washington or the Dome Central at Paris. The lighting of this dome in particular is to be unique, and cannot fail to be effective. On the floor of the dome, which is octagonal, there will stand in the 8 angles 8 great spreading candelabra of special and beautiful design, each bearing 50 16-candle

power lamps. High up, at the spring of the interior dome, is a gallery running clear around the dome. The gallery has a metal railing, and upon this railing will stand 56 7-light standards, forming a grand corona of light 120 feet in diameter. Far up above and through the opening in the top of the false dome will be seen the beautiful painting upon the ceiling of the outer dome, as it is illuminated by a circle of arc lights which are themselves hidden from view between the two domes. For this arrangement of light, the Exposition is indebted to Mr. Luther Stieringer, who has devoted himself to the study of the lighting problems at Jackson Park, and whose judgment, acquired by a lifetime of unusual experience, has always aided in their solution.

An effective piece of lighting will be seen in the Fisheries Building. The large circular pavilion upon the east will be used as an aquarium.



50-Light Candelabra in Administration Building.

Around the building are arranged continuous concentric rows of great tanks. The sides of these tanks are of clear glass and are continued to the ceiling by stained glass screens, so that the observer walks in a covered corridor, the sides of which are of glass, and through which can be seen the representatives of all the finny tribes disporting themselves in their native element. At night no lights will be visible, but the tanks will be lighted by hundreds of incandescent lamps placed under screens above the tanks, so that the light does not strike the eye, but is diffused throughout the water, lighting it up as effectively as daylight.

The Terminal Station, Festival Hall and Wooded Island will be lighted from a separate machine located in the German exhibit space in Machinery Hall. This plant, which is to be installed and operated by the Siemens & Halske Company, of Berlin, will be of interest to electricians, as it will comprise arc lamps of 3, 6 and 9 amperes, as well as about 2,000 incandescent lamps, all operated from one generator, and the incandescent wiring will be installed upon the 5 wire system, with equalizers at the centers of distribution, thus forming a working exhibit of a station practice not before seen in this country. The Wooded Island will be lighted with 25 candle power incandescent lights, placed in large closed shades upon short ornamental posts, and the soft lighting of the many lamps among the trees and shrubbery will form a pleasing contrast to the intense light of the arc lamps about the main buildings.

Many problems have presented themselves to the designers and builders of this plant, but the continued aim of all concerned has been that it should have above all the two great requisites of an ideal station—safety and reliability.

Mammoth Gasholder Recently Constructed for the Chicago (Ills) Gas Light and Coke Company, at the Station, Corner Deering and Cologne Streets

The rapid growth of the gas companies in our large cities has developed a tendency to construct gasholders of large capacities.

In 1888, the Consolidated Gas Company, of New York City, erected a holder of 3,300,000 cubic feet capacity, with a steel reservoir, and added another holder of the same capacity in 1890. Two more of similar capacity are now under construction for the same Company.

The Chicago Gas Light and Coke Company was the first to take a decided step toward holder construction of considerably increased capacity beyond those referred to above, which resulted (in 1891–2) in the construction of the first 4-lift gasholder in America.

The gasholder was designed, executed and erected by the firm of Bartlett, Hayward & Co., of Baltimore, Md., and is now the largest in this country. The dimensions of the holder, which was provided with a tank of masonry, are as follows:

Brick tank				190	ft.	0	in.	diam., by 43	ft.	6 in. depth.
Inner, or first section of holder				179	"	6	"	" 42	"	9 " "
Second section	"			182	"	0	"	" 42	"	3 " "
Third section	"			184	"	6	"	" 41	"	9 " "
Outer, or fourth section	"			187	"	0	"	" 41	"	3 " "
Working capacity				4,289,500 cubic feet.						

The illustrations convey a fair idea of the magnitude and general construction of the work, and through the courtesy of the constructors, Messrs. Bartlett, Hayward & Co., we are enabled to give the following general description. The basis of calculation for strains in all parts of the structure was a pressure from wind having a velocity of 100 miles per hour.

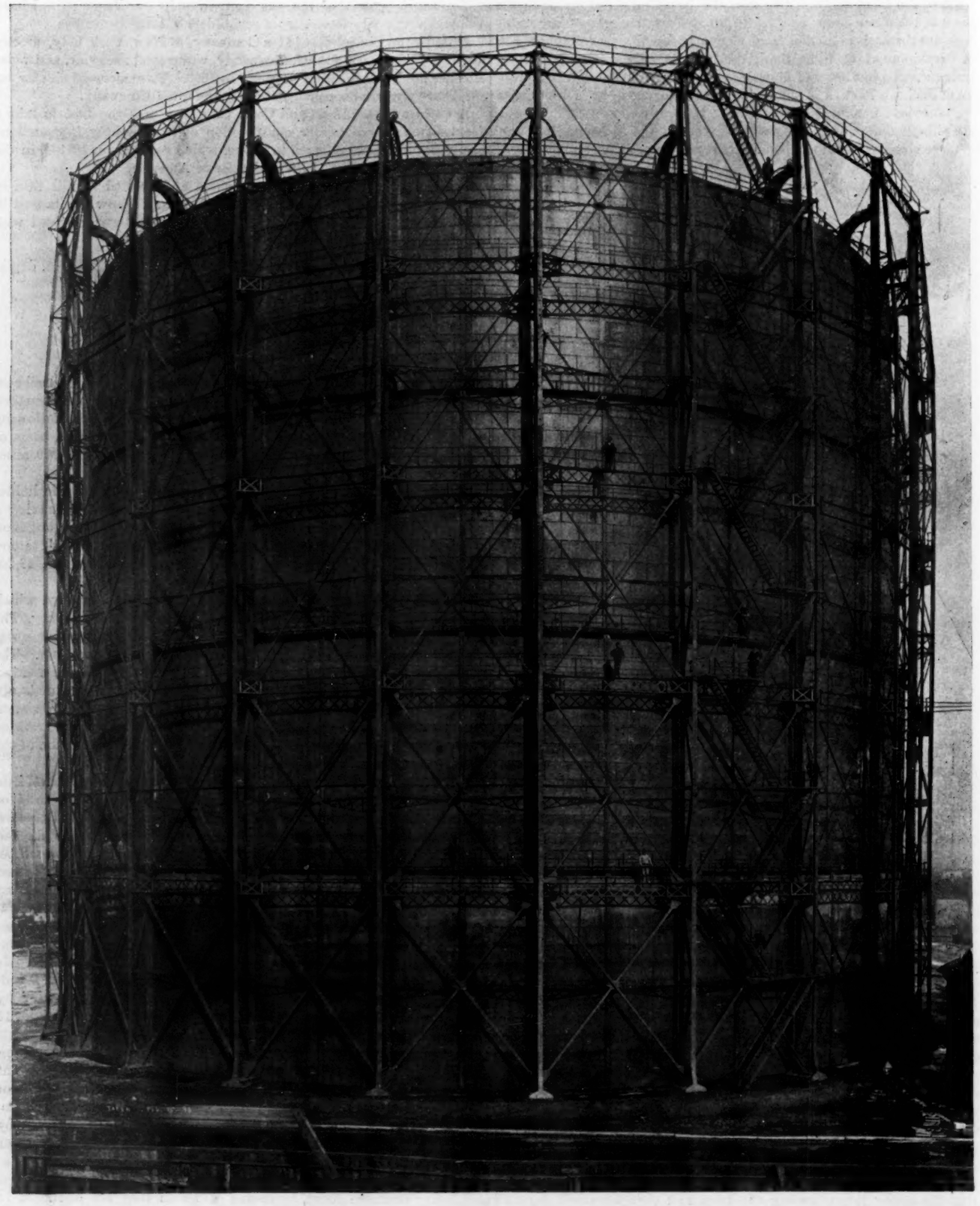
All of the material that entered into the construction of the holder and guide frame was of a tough, ductile and fibrous quality, having a tensional strength of 50,000 pounds to the square inch, and an elongation of 15 per cent., in a distance of 8 inches, in specimens of one-half square inch sectional area. The rivets have a tensional strength of 48,000 pounds and an elongation of 20 per cent.

The excavation for the masonry tank was mostly in blue clay, which latter material was also used for the puddling back of the masonry. The foundation for tank wall was made of concrete, and the large cone was paved with brick on edge and covered with cement grouting. The thickness of the brickwork varied from 7 feet, at the lowest footing course, to 30 inches immediately below tank coping. The reduction in thickness of wall was made in 7 offsets, varying in height in proportion to the reduction of internal pressure. Only the best of materials of their respective kinds were allowed to enter into the construction of the tank.

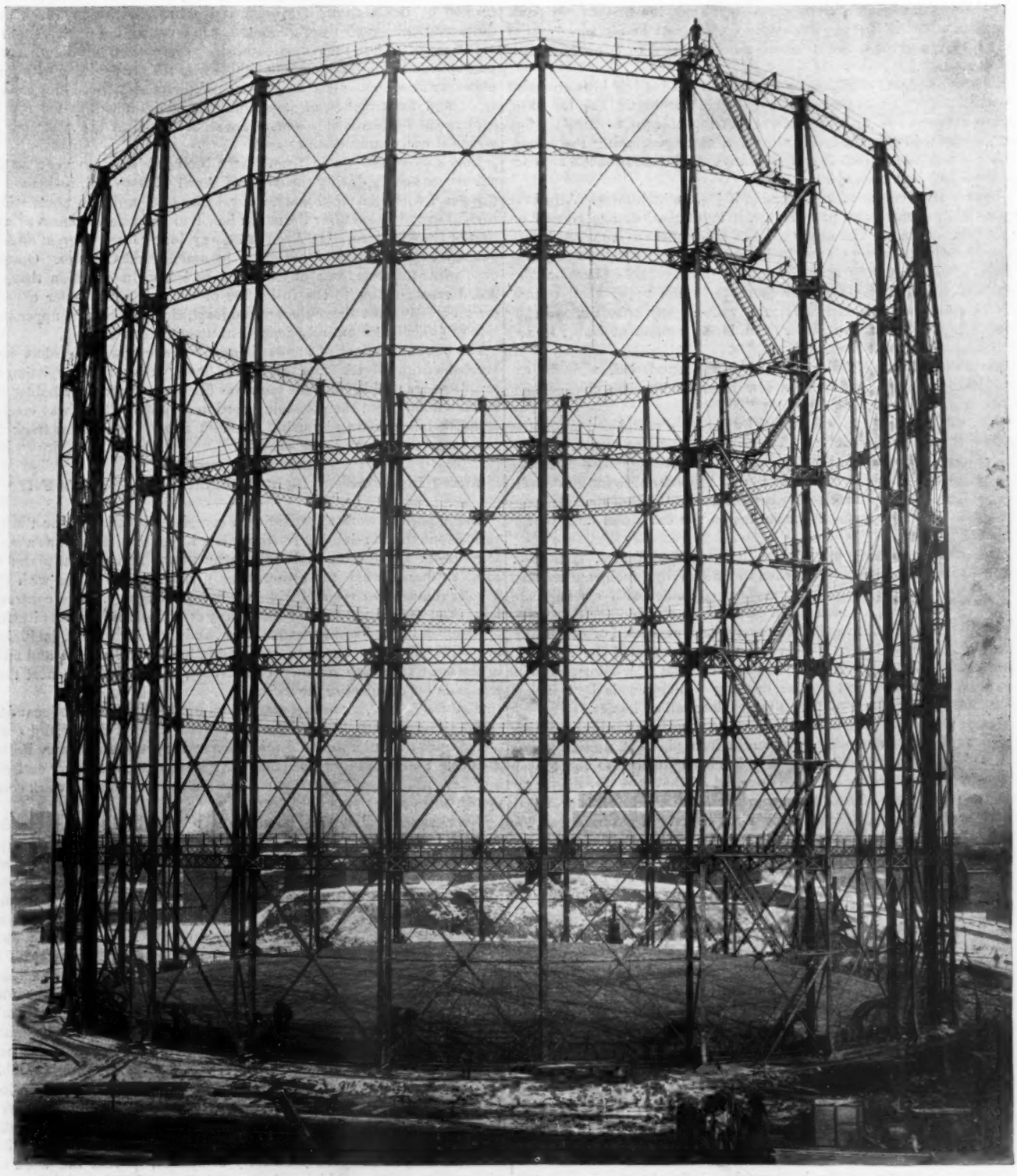
The tank is provided with three sets of 30 inch diameter cast iron stand pipes, so arranged that either of them would answer as inlet or outlet pipes to the holder. The inner pipe, and the horizontal pipe below the tank wall as well, are constructed of heavy cast iron flanged pipe, provided with strengthening ribs under the flanges located between the bolt holes. The stand pipes on outside of tank are composed of cast iron bell pipe with lead joints. The tank guide rails, consisting of 7 inch heavy steel I beams, 24 in number, are attached to the masonry by means of heavy cast iron brackets with adjusting pieces, so that the rails could be erected after the masonry of the tank was completed. The rails are located in line with guide rails of upper guide frame, and form a continuous rail from bottom of tank to top of standards of guide frame. The standards are attached to the masonry by heavy foundation bolts, 4 for each standard, provided, at a depth of 15 feet below the coping, with heavy cast iron anchor plates.

To support the weight of the crown plating when the inner section is resting upon the landing piers (which are distributed equi-distant around the circumference of tank wall), a permanent framework of timber was constructed upon the cone-shaped tank bottom. The framework consists of 4 concentric rings of vertical posts, all connected by diagonal and horizontal bracing to a common center post. The upper ends of posts are connected by purlins and rafters of proper shape to coincide with curve of holder crown. The heels of all posts are provided with heavy cast iron shoes, by means of which they are anchored to brick piers supporting them.

All of the timber used in the construction of the permanent frame is heavy yellow pine; the total weight of framework being 25 per cent. in excess of the weight of the displaced water. The upper part of tank wall is protected by a stone coping 6 inches in thickness, immediately below the inner edge of which, around the entire circumference of



Holder Constructed by Messrs. Bartlett, Hayward & Co., for the Chicago Gas Light and Coke Company.



Holder Constructed by Messrs. Bartlett, Hayward & Co., for the Chicago Gas Light and Coke Company.

tank, is located a stone ashlar, 18 inches deep by 4 inches in thickness. This ashlar protects the brickwork against deterioration from the formation of ice on the water line.

The brick tank was completed late in the year 1891, and as the severe weather during the winter did not admit of erecting any ironwork, for either the holder or guide frame, the tank was filled with water during the winter months to prevent destruction of the masonry by frost.

The erection of the ironwork was commenced in the early part of April, 1892, and the entire structure was completed November 15 of the same year.

The four sections of gasholder were constructed of best blue annealed iron. The cups are 10 inches wide and 18 inches deep. The top sheet of the curb extends 15 inches above the top of grip, to cause the cup water to overflow on the inside of holder, thus preventing the formation of ice on the outside from this source. All the cup sheets are constructed of ⅜-inch boiler plates.

The top shell course of inner section is ⅝ of an inch thick. All of the seams of this course are provided with butt strips, double riveted on either side of seam. The upper edge of this course is connected with the outer edge of crown plating by heavy 6 x 6 angle iron, and the outer course of crown plating is ⅜ of an inch thick. These plates are also provided with butt joints similar to those in the upper shell course. The crown of inner section is formed without any trussing, and constructed upon the rafters of before-mentioned permanent timber frame, which have the exact curvature.

Upon the inflation of holder with air it was found that, with the exception of the straightening of a few loose buckles, no change took place in the shape of the crown.

Each of the four sections is guided by 24 sets of radial and tangential rollers, consisting, for each side, of one radial and two tangential rollers. The radial as well as the tangential rollers are supported by heavy steel axles, adjustable in every direction. The carriages for guide rollers are constructed entirely of wrought iron, and all of them are provided with braces to transmit the strains to the curbs and cups of the different sections.

The inner section is provided with vertical stiffeners, **U**-shaped, formed of best flanged steel, attached to the shell by ¾-inch countersunk head bolts, provided on the outer surface of holder with ribbon plate 12 inches wide and ¼ an inch thick. The shells of the other three sections are provided with vertical stiffeners, each composed of one heavy 6-inch channel and two angles riveted to the flanges of the channel. The outside and inside stiffeners are located so that after being placed in position they form a rectangular opening 6 inches wide by 5 inches deep, through the center of which passes the shell of holder.

Around the outer edge of holder crown is placed a guard rail consisting of angle iron standards and wrought iron pipe. A similar guard rail, supported on projecting brackets, has been attached to the top of each grip, thus affording access to any part of the cups during heavy storms. The crown of holder, as well as each of the grips, is provided with two projecting platforms, constructed entirely of wrought iron, located diametrically opposite to each other, by means of which easy access is to be had to the cups from the vertical ladders of guide frame. The severe climate, heavy wind storms and long spells of extremely cold weather during the winter months necessitated the provision of galleries around the cups. This arrangement has given the utmost satisfaction during the severe storms to which the holder has been subjected since it has been in operation. The above described platforms are reached by means of a complete stairway extending from the ground to the top of guide frame. The entire stairs are built of wrought iron, and are suspended from the girders and standards of guide frame. Each of the girders is also provided with guard rail, as from them, at diametrically opposite points, the vertical wrought iron ladders extend to the before-mentioned platforms of holder crown and cups. Under no condition will it be necessary for a man to ascend on the vertical ladders a greater distance than that located between two girders of guide frame. It would have been impossible for a man to ascend on the vertical ladder the entire height of guide frame during the blinding snow storms that are characteristic of the Chicago climate.

The total pressure on the holder, when inflated with air, was 13½ inches. All of the cups are provided with steam pipes extending around the inner circumference of same.

The guide frame of holder consists of 24 wrought iron, trussed standards, which are connected by heavy cast iron bases to the masonry of tank wall. Each standard is divided by the intersection of girders into 5 separate trusses. Each of the trusses consists of a front and back chord, a main strut and 2 diagonal ties or braces. The entire standards are composed of angle and bar iron, of such cross sectional dimensions as will fully resist the strains imposed upon them from wind having a velocity of 100 miles per hour. The standards are connected by 5 rows of wrought iron latticed girders, constructed of angle and bar iron, and connected to standards by means of heavy wrought iron web plates and short wrought iron latticed struts extending from front and back chords of standards to top and bottom chords of girders. The different bays formed by intersection of girders and standards are provided with diagonal ties of angle iron, diminishing in cross section from bottom to top in proportion to the reduction of strains imposed upon them. At the point of intersection the diagonal angle iron ties are provided with joint plates, from which extend in a horizontal direction latticed ties to both front and back chords of standards. In addition to the top row of girders the standards at this point are secured against heavy strains by wrought iron wind ties and struts.

The holder and guide frame have been subjected to very severe storms, especially during the week of April 16th to 22d, inclusive, of this year, when the wind reached a velocity of 80 miles an hour, and a careful examination after the storm failed to indicate weakness in any part of the structure. On April 22d the cyclone caused a great deal of damage by destruction of buildings in and around Chicago. On this day, while the storm was at its height, and from a direction that exposed the structure to the full force of the storm, the outer edge of crown was 103 feet above the ground level, thus leaving the upper portion of guide frame entirely dependent upon its own bracing.

The 3 lower sections of standards and 3 lower rows of girders were erected with a derrick from the ground level. Upon the completion of the structure to this point the tank was filled with water, the holder inflated with air, and the remaining portion of guide frame was erected from the holder crown by using a derrick run on a circular track located near the outer edge of crown.

Model Incandescent Lighting Plant at the World's Fair.*

The important work of providing a complete installation for the incandescent electric lighting for the entire Exposition, as well as a good share of the arc lighting and the electric power service, was placed in excellent hands when the contract for this work was made with the Westinghouse Electric and Manufacturing Company. The contracts have been carried out to the letter; many details and refinements having been added beyond what was called for, and the entire plant, including everything from the lamps to the engines, has been designed and built in the most thorough manner conceivable, in view of the short time available for completing the work.

On June 8, 1892, a contract was drawn up for this immense incandescent lighting plant. This contract, however, was not signed and completed until the latter part of June, when active preparations were begun at once. Since that time, all plans have been made, including entirely new designs for the dynamos, and the whole of this colossal work completed.

Work was started at once, upon the completion of the contract by designing a suitable system of underground conduits and converter pits, etc. On July 1st the conduits and manholes were laid in the surroundings of the woman's building, which was then practically complete, and the grounds surrounding it ready for the landscape gardener. The contract called for the completion of all underground work by September 1st, and this was practically accomplished by the New York Insulated Wire Company, to which the Westinghouse Company had awarded a sub contract for all the construction work outside of the central station in Machinery Hall. The vast work of wiring the large buildings was taken up as fast as they reached a sufficiently advanced stage to work in them to advantage. In many cases, however, this could not be done, owing to the fact that the nature and location of the lighting was not decided upon by the Exposition, and, in the case of purely exhibit buildings, the wiring could not be begun until exhibitors had decided what lighting they wanted. This naturally caused vexatious delays; the first plans for the lighting of exhibit spaces not being received until the last week in March. At this time the wiring for about 50,000 incandescent lights had been practically completed, so that the work of wiring for exhibits could be pushed rapidly forward, although it was an utter impossibility to complete everything, as applications are even now coming in, and exhibitors will probably order lights and changes for some weeks to come. It is notable that, although the wiring is only to be used for six months, it is all done so thoroughly that one will be unable to find very many installations in America that will compare favorably with it. The form of construction adhered to throughout is of the very best.

* By Mr. E. E. Keller, in *Western Electrician*.

All lighting is controlled from closets located at convenient points in the buildings, where most of the switches and all of the fusible cut outs are placed. The wiring was so planned that not more than 12 lamps are dependent upon one cut out, and, where it was possible, the circuits were so arranged that only part of the lights in any one location would be affected in case of trouble. All wires, no matter where located, can be reached without any delay, as the running of wires in inaccessible places was strictly avoided. In all cases the wires are led to and from the cut out closets in mouldings or iron pipe, excepting in places where they could be run on glass insulators through roomy spaces in the hollow walls, where a permanent means of access to these hollow spaces was always provided. Where hollow spaces could not be made accessible, or where they were too narrow, iron pipe inside, or wooden mouldings outside the walls were resorted to, over 300 miles of pipe and mouldings being used for this purpose alone. Where iron pipe was used, both legs of the secondary circuits were invariably run in the same pipe to guard against self-induction. The secondary wiring for the installation has been planned and installed for a drop of 3 per cent., with a variation of not over 2 per cent. between any two lamps on the grounds, and the uniformity of the lighting shows how well this was done. In order to avoid the errors that would have occurred had the common method of determining the direction, location and sizes of wires been adhered to, it was made an inviolable rule that no wiring should be erected without a complete detail drawing. In every case, all necessary calculations and drawings were made in the office, giving the foreman all required information, thus securing a uniform construction and a permanent record for future reference in case of trouble. A thorough system of inspection was maintained throughout the work, both on the part of the Exposition and the contractors, with the result that remarkably little trouble was encountered after the completion of the wiring.

The primary system of this entire plant is underground, not a single wire being overhead, with the exception of that portion of the grounds located south of Machinery Hall and Agricultural Building, where it was decided to use overhead construction owing to the nature of the buildings and exhibits in this section. In this portion of the grounds the wires are carried partly on the structure of the electric elevated railroad and partly on a pole line.

The circuits for the main portion of the grounds leave the station by means of lead covered duplex cables of the Standard Underground Cable Company, passing through vitrified ducts to a fireproof room at the side of the main subway located under the floor of Machinery Hall. Here some of the lead cables end in rubber terminals, and to these are joined Grimshaw wires with 125 miles of rubber insulation going to the eastern portion of the grounds by way of the large subways in which the wires are strung on cross arms and glass insulators. In this subway, which has been frequently described in the electrical journals, the wires are carried 5 inches apart to the Administration, Mines and Mining, Electricity, Manufactures and Liberal Arts, Government and Fisheries Buildings. From the latter point, the circuits going north to the various State and foreign buildings are again joined to lead covered duplex cables and carried in wooden conduits. In the circuits going to the western portion of the grounds, lead covered cables are used throughout, the cables being laid on the floor as the main subway until the north wall of Machinery Hall annex is reached, when they are carried in wooden ducts composed of pump logs. Wherever the circuits and laterals leave the main subway, a duplex lead covered cable is joined to the rubber covered subway wires and is carried to its destination by means of pumps logs, a vitrified pipe being used in cases where buildings are entered. This system of primary wires is connected to special converters of the Westinghouse type, most of which are of 13 kilowatts capacity, there being some of 6,250 watts and some of 2,000 watts capacity. All of these converters are placed in ventilated pits of special design located at most convenient points. These converter pits are built of wood, with a galvanized iron lining so arranged as to exclude moisture and still permit of thorough ventilation. Primary fuse blocks of special design were placed in the pits, there being no fuses in the converters. These primary fuse blocks are designed to also fill the place of a primary switch, so that any or all converters in the pit can be disconnected from the primaries for testing or repairs. The secondary fuses are placed in closets inside of the building. Each converter is connected to a separate secondary circuit, and these circuits are each supplied with a main switch placed in the cut out closet. Converters are in no case "banked."

Besides the incandescent lighting furnished from this system of primaries, there are over 1,000 arc lamps operated in all parts of the grounds from the same wires. The arc lamps used for this work are partly of Westinghouse manufacture and partly of the manufacture of the Helios Electric Company, of Philadelphia. All of these lamps are operated from what are termed Westinghouse "economy coils," which permit of one, two or three arc lamps being connected across the 105-volt terminals of the secondary system, without resistance coils being required to absorb the current of lamps not burning in the series. These "economy coils" are placed in convenient locations in the buildings. The lamps are designed for 14 amperes at 35 volts pressure.

In several locations it was found necessary to operate motors where the 500 volt power circuits were not available, and in these places two-phase alternating current motors are connected to the system. Where fan motors and other small motors are required, they are simply connected to the secondary lighting circuits, an ordinary alternating current motor being used.

Besides this work, the Westinghouse Company furnishes a novel system of lighting for the buoys that have been placed along the shore of Lake Michigan, for a distance of 7 miles, from the Chicago river to the main pier at the Exposition grounds, by the United States Government. For this purpose 13 spar buoys have been placed at points along the shores to indicate the shoals. Each buoy carries an incandescent lamp of 100 candle power in a wrought iron cage or lantern at the upper end of the spar, the lower end of which is fastened to a heavy cast iron anchor. The current for each of these lamps is supplied from a small Westinghouse converter, of special design, placed in the upper end of the spar. These converters are connected in series, the current for the entire series being obtained from a special Westinghouse converter of 1,400 volts. This large converter is placed at the outer end of the main pier at Jackson Park, where all necessary switches, fuses, regulating devices and Wurts non-arcing metal lighting arrestors are also placed. For this work a single wire Bishop gutta percha submarine cable is laid from the pier to the first buoy; from there to the second, and so on. From the last buoy at the city the cable returns by the most direct route to the pier at Jackson Park. On the whole, this system of lighting buoys promises to come into extended use for harbors along the sea coast.

The central station supplying current to this entire system of incandescent lighting, arc lighting, and power service is well worth several days' study on the part of any one interested in work of this character. When the contract for this work had been secured, it was at once decided that the scope of the work required something out of the ordinary line of generating apparatus, and plans were made for an entirely new type and size of dynamo. It can be imagined that this called for energetic action on the part of the Company's engineers at Pittsburg and the carrying out of the work night and day in the factories. The result of the tireless energy displayed is a station of a very simple and practical character, considering its size. This lighting plant is located in what is known as the power plant, a stretch of space 100 feet wide along the south wall of Machinery Hall next to the boiler house. These are 12 two-phase alternating current dynamos of a capacity to supply 15,000 50 watt lamps each, and 2 single phase dynamos of 4,000 lights capacity each, also one 700-horse power 500 volt continuous current generator. Six of the 12 large dynamos are coupled direct to Westinghouse compound engines of 1,000 horse power, specially designed and built for this work. The other 6 dynamos are belted directly to engines of different manufacturers. These dynamos operate at 200 revolutions per minute with a frequency of 7,200 alternations. In the space directly opposite the main entrance of Machinery Hall, and in the center of the south portion is a space about 100 feet square in which an E. P. Allis Company's Reynolds-Corliss quadruple expansion engine of 2,500-horse power drives 2 large dynamos in tandem. In this same space is a Corliss engine of 1,000 horse power capacity, built by Fraser & Chalmers, which drives another of these dynamos. Besides these 3 large dynamos, there are 3 direct coupled dynamos of the Westinghouse railway generator type of 100 horse power each, wound for 250 volts, and used as exciters for the entire plant. Here also are the two 4,000 light machines, driven by belts from two Westinghouse compound engines of 350-horse power each. In the space next west of this, which is only 42 by 97 feet, are located 4 of the direct coupled dynamos, showing the remarkable saving in space effected by the use of this type of engine and method of coupling. The engines in this space are of entirely new design, and are among the first high speed engines of this capacity built in America. They are vertical compound condensing, with the low pressure placed above the high pressure cylinder, the crank, connecting rod, etc., being entirely enclosed and running in oil, as in the single acting type of Westinghouse manufacture. The governor, operating in an oil case, is of the same general type as the one used in single acting engines. The shaft makes 200 revolutions per minute and carries a fly wheel 11 feet in diameter, weighing 12 tons. It is coupled to the dynamo shaft by a flexible coupling without insulation. In the space just west of these

generators are located the remaining belt driven machines. These have pulleys 9 feet in diameter, and are driven by 72 inch belts from McIntosh & Seymour, Atlas and Buckeye engines of 1,000-horse power each. These engines are all compound and run with condensers. In the space directly west of these engines are located the last 2 dynamos, which are also driven direct from 2 of the new 1,000-horse power Westinghouse compound engines. The 700-horse power generator supplying part of the exposition power service, is located just east of the incandescent lighting plant. This is driven by a cross-compound Reynolds Corliss engine of 700 horse power capacity, the armature being between the two engines on the same shaft. The fields of this large generator are so designed as to slide away from the armature to allow of repairs to any part without lifting, unless there should be trouble in the bearing. This machine furnishes current to the general power distribution system in the grounds.

All of the incandescent machinery in this plant is controlled from a single switchboard, which is by far the finest piece of work of this character that has ever been carried out. It was deemed inadvisable to place switchboards at different parts of the extensive space covered by the machinery, principally for want of floor space. To gain space and to have the switchboard attendants in a location where their attention would not be so frequently called from their work, it was decided to place the entire switchboard on specially designed galleries. These switchboard galleries are placed against the south wall of Machinery Hall, immediately in the main center. The lower gallery is 20 feet wide and 40 feet in length. On this gallery is placed the dynamo switchboard. This board is composed of 13 panels for the alternators, 4 panels for four 100-horse power generators used as exciters, and 1 general exciter panel. Twelve of the alternator panels are used for the 12 generators, the 13th being used for the two 4,000 light alternators. This dynamo board is built of iron and marble, no combustible matter whatever entering into its construction. All of the connections are behind the board. On this same gallery are arranged the large rheostats for the field circuits of the generators. The panels on this gallery are connected with the dynamos by means of lead covered cables supported on the floor in special iron brackets, and led down the wall behind the paneled sheathing, from which point they are distributed to the different machines underneath the floor of Machinery Hall, by the use of lead covered cables supported in iron clamps. The lower gallery is reached by a single iron spiral railway, and the upper gallery, which is 14 feet in width and 83 feet in length, is reached by two narrow stairs, one at each end of the dynamo board. On this upper gallery is located the feeder board, which is also built of iron and white marble. This feeder board consists of a panel for each of the 40 feeders leaving the station for the different parts of the ground. Nothing appears on the face of it but the indicating instruments, and the handles of the switches, with the various plugs and cords required in making changes from one dynamo to another. As in the case of the dynamo board, all wiring is back of the panels and everything is made as nearly fireproof as possible. Behind this board are located the transformers for the Stillwell regulators, one of which is inserted in each of the 40 feeders leaving the station. These regulators provide for a variation of 10 per cent. in the feeders, the losses in the feeders themselves ranging from 2 per cent. to 10 per cent. under full load. All of the instruments used on both switchboards are of the frame less plate glass case type. Each panel is made a duplicate of all other like parts in the board, everything being interchangeable. The trimmings on both boards are nickel plated metal and hard rubber. The feeder board is so arranged that any one of the 40 circuits can be operated from any one of the dynamos of the plant. It is also so designed that in case of one of the dynamos becoming disabled, the feeders of this particular machine can be changed to a relay dynamo, always kept in operation, by simply pulling the switches. It is impossible to fully describe the switchboard or any part of the installation in a short article, as the exhibit must be visited to fully appreciate the character of the work.

Besides the incandescent lighting plant just described, the Westinghouse Company furnishes all the power for driving machinery in the Mines and Mining Building. For this purpose two 150 horse power 500-volt continuous current motors of the multipolar type are installed in the Mines Building and connected to the shafting-driving exhibit machinery. These are operated from the large power generator in Machinery Hall.

In Electricity Building a very creditable exhibit is to be made, some of the special features being a long distance power transmission plant, in which is shown a 2-phase generator driven by a Pelton water wheel, the current from this generator to be led to "step up" transformers and then to "step down" transformers. In another space are multiphase motors, revolving transformers, incandescent lights, arc lights, street railway motors and other devices, all operated from the alternating current generator in the space across the aisle. In this exhibit is also shown a 500 horse power 2 phase alternating current motor. A complete exhibit is made of incandescent and arc lighting apparatus of the ordinary types of Westinghouse manufacture, and also of the various details manufactured. In another block of space in this building may be seen the railway exhibit of the Westinghouse Company, which comprises large belt driven railway generators, and one of the direct connected 270-horse power "kodak" generators. The space occupied by Westinghouse exhibits in Electricity Building is something over 15,000 square feet.

Economical Gas Power Plant.

A writer in *Industries* (English) says that on several occasions that authority has called the attention of its readers to the future which was reserved for the economic production of motive power by the use of gas engines supplied with cheap gas. Since the year 1884 Messieurs Delamare, Debouttevillle and Malandin have studied the possibility of applying producer gas, or *gaz pauvre*, to their well known "Simplex" engine, and for this purpose had installed in their works, Fontaine-le-Bourg, France, a generator of the "Dowson" pattern. Success attended their efforts, for in the year 1888 an engine of 50-horse power was constructed for M. Barataud, corn miller at Marseilles, and we are informed that this engine has worked night and day ever since. Moreover, the deleterious effects known to be produced by the very high temperatures in the cylinders of engines using this gas are said to have been obviated, as the removal of the piston has recently proved. The trifling deposits formed in the cylinder are stated to be practically negligible, and the cleaning of the walls is rendered a rare occurrence. The gas generator has given equally good results. A 100-horse power plant has also been installed in a cotton mill. Messrs. Matter & Co., of Rouen, who have taken up the construction of these engines in their most approved form, are also the makers of gas producers on the Buire Lencauchez system, and several of these installations, from 16 to 100 horse power, have already been carried out, while one of 200 horse power is now in course of construction. In an installation of 60 brake-horse power, which has been erected for Messrs. Gavelle, Hall & Co., flax spinners, Abbeville, France, the gas is produced, not from Welsh anthracite, as used in the earlier installations mentioned, but from inferior coal from the mines of Vicoigne and Nœux, which is much lower in price than the former. The generator is composed of a sheet iron cylinder which contains a refractory lining, separated from the casing by a sand jacket, to prevent radiation of heat. The fuel is introduced by a hopper into the interior of the generator, and is supported by a grate; a series of oblique bars prevent the fuel from falling into the ashpit, and allow the admission of a current of air to support combustion; while a valve causes a fine jet of water to enter a hollow bar at the bottom of the generator. The water, after being heated in this space, falls in drops into the ashpit, where it is partly vaporized. The vapor afterwards penetrates the incandescent fuel and is decomposed, the excess of water being drawn off. A fan, driven from the main shaft of the engine, forces a current of air into the bottom of the generator, and this carries up with it the aqueous vapor. It produces, in burning the fuel, carbonic oxide; the latter mixed with the hydrogen of the hydrocarbons and the nitrogen of the air gives a gas of the following composition:

H	= 20.00	45 per cent.
CO	= 21.00	
C_2H_4	= 3.50	
C_4H_6	= 0.50	
O	= 0.50	55 per cent.
CO_2	= 5.00	
N	= 49.50	
	100.00	

The analysis given in the table is that of gas produced by Welsh anthracite.

On leaving the generator at the top the gas passes by a pipe to the bottom of a scrubber containing a water seal—and in which the coke is changed once in three months—to the gasholder. The production of gas in the generator is automatically regulated by means of a valve which is opened and closed, admitting or excluding the current of air, by means of a suitable connection with the holder. When the latter falls below a predetermined point the valve allows the air current to enter the producer. When the engine is stopped it is necessary also to stop the action of the producer, to effect which the air intake is opened to the desired amount, as is also a valve on the top of the generator.

This establishes a slight draught through the producer, sufficient to reduce to a minimum the consumption of fuel, and maintain it alight for one or two days. The coal consumption naturally varies according to the quality employed, but to a smaller extent than might be imagined. Thus, from tests made with Welsh anthracite and common coal from the mines of Vicoigne and Nœux, a difference of only 50 grammes (about ⅛ lb.) per horse power hour was found. Returning to the gas engine, it may be stated that the various details have been improved so as to enable the poorest quality of gas to produce the maximum result. The large slide valve chest, which formerly served for the introduction and ignition of the gas, has been replaced by a simple igniting device, which permits of the regulation of the periods of ignition according to the load while running. The automatic starting mechanism, which—for large engines—has obviated the use of an additional small motor, is worthy of mention. The piston is first caused to move through a part of the stroke by means of a wheel and axle placed against the flywheel. During this displacement the explosive mixture is introduced into the cylinder by means of the vacuum created, the ignition being effected by means of an electric spark. The introduction of the mixture is arranged to take place at the third period of the cycle—that is, the ignition period.

The working of these engines, we are informed, is exceedingly regular, and their application to electric light installations has given excellent results.

The Latest Askins Gas Process.

The *American Manufacturer*, in commenting on the topic named in the heading, remarks that for some months past there has been considerable published regarding the Askins fuel gas process. In February last Mr. Askins was granted a patent for improvements in apparatus for the manufacture of water gas. The specification states that the invention consists in the combination and arrangement of the several parts of a gas making apparatus, comprising a furnace or generator for the production of hydrocarbon vapors and gases, a water gas generator connected with the hydrocarbon vapor generator and receiving the hot gases and vapors therefrom, and a body of perforated tiles or checker brickwork, supported in the upper part of the water gas generator and forming therein a perforated fixing surface through which the vapors and gases from the hydrocarbon vapor generator are passed horizontally, and thus brought into contact with the ascending currents of water gas, whereby the mixture of gases is fixed by contact with the heated surfaces, and thence conducted to a scrubber or to a suitable gas receiver. The water gas generator has arranged, across the upper part of its chamber, tiers of tiles about 3 inches thick, built into the walls of generator and spaced apart at intervals about 3 inches, opposite individual tiles or tile sections meeting centrally, and through and between these tiles the gases from generator pass horizontally to the delivery end of the water gas generator, while the water gas and hydrocarbon vapors become commingled and fixed by exposure to the intense heat of the upper part of the chamber in which the tiles are arranged. These tiles or tile sections are also provided with perforations throughout, to permit the passage of the commingled gaseous vapors from the furnace and the hydrogen gas, etc., entering the spaces or passages between, whereby the gas is caused to pass over a greatly extended heating surface, while the tiles or heating surfaces themselves, by thus causing the heat to pass through the honeycomb like surface, are quickly and thoroughly heated.

By employing the tiles in the manner described it is possible to dispense with the blast apparatus usually required in generators, and, further, it is claimed that the tile or checkerwork can be heated in considerably less time than usual, as it is in close contact with the fire and each side of the tiles is exposed to the heat, thereby effecting a saving of fuel.

In operating this gas making apparatus the drafts of the water gas generator are opened while the generator and the tiles in its upper part are being heated, after which the cover is shut down. When the coke fuel in the generator has become incandescent, steam will be admitted to the generator. The fire in the hydrocarbon vapor generator is produced by the combustion of coal. The hydrocarbon oil fed into the furnaces is vaporized by the heat of the furnace and is mingled with the coal gas and volatile products of combustion. From this generator the mingled hydrocarbon vapor and gases pass through the pipe into the upper part of the water gas generator in contact with the intensely heated tiles or brick checkerwork through which they pass in a horizontal direction. While thus passing horizontally through the checkerwork the hot hydrocarbon vapors are mingled with the ascending water gas, and by contact with the intensely heated tiles the gases become fixed before passing off to a scrubber or to a suitable receptacle.

With this form of apparatus the blast usually employed in the process of gas making is dispensed with, and by reason of the location and arrangement of the gas fixing surfaces or tiles, adjacent to the fire, they can be heated intensely in much less than the length of time ordinarily required for such purposes.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following letter explains itself:

NEW YORK, May 8, 1893.

To the Editor AMERICAN GAS LIGHT JOURNAL: In your issue of May 1st, page 641, appeared an editorial notice of gas matters at Detroit. It is therein stated that a "Citizens Gas Company" submitted a proposition to the Council to supply gas by the Archer process, and that the heating power of the domestic fuel gas would be "six times greater than natural gas." This silly statement places the Archer process in a false light. I have no knowledge of the *personnel* or otherwise of the referred to Citizens Gas Company, and the statements made are without my knowledge or consent. I disclaim and repudiate the absurd claim set up as to the heating power of the Archer process gas. No one possessed of the slightest knowledge of natural or manufactured gas would put forth such an absurd claim. The Archer domestic fuel gas is high in heat units per foot, as shown by reliable analysis. It is the equivalent of natural gas, and that is certainly all that could be desired.—Respectfully, J. B. ARCHER.

WE quite agree with Mr. Archer in respect of his opinion that the statement made by the projectors of the Citizens Gas Company, to the authorities of Detroit, in the attempt of the former to secure a gas franchise for that city, is a "silly" one—in fact, we would go further and pronounce it the vaporing of idiocy; and it is with satisfaction we publish Mr. Archer's disclaimer. The fact is, however, that section seven of the Citizens Gas Company's application for a franchise reads thus: "7.—Fuel gas, with six times the heating properties per 1,000 feet of natural gas, to be sold to consumers for 50 cents per 1,000 cubic feet, if paid on or before the 10th day of each month." Like Mr. Archer, we are not very well posted in regard to the solvency of the gentlemen comprising the aforesaid Citizens Gas Company, but if they are as wide of solidity in that respect as they are far from reliability in the instance of the heating value of the gas they propose to distribute, then are they many points below par. Before taking leave of the matter it might be pertinent to remark that Mr. Archer is to be congratulated if he has approached the point in the development of his process gas where he can successfully demonstrate that that gas "is the equivalent of natural gas."

FROM a line or two recently received from Mr. William Enfield, we glean that the recent reorganization of the Texarkana (Ark.) Gas and Electric Light Company resulted in the election of the following officers: President, B. T. Estes; Vice-President, George W. Fouke; Secretary, Treasurer and General Manager, Wm. Enfield. The plant is capable of turning out 40,000 cubic feet of gas per diem, and the electric equipment can be depended on to keep up 100 arc and 1,000 incandescent lamps, respectively. Mr. Enfield adds: "Our side of the successful undertaking is assured, and it only remains for the people of Texarkana to aid us in making it a rounded and complete success." And it may be taken for granted that the clever General Manager will see to it that nothing is left undone that should have been done to achieve the success that should accompany well-directed enterprise.

AT the regular annual meeting of the Decatur Light and Power Company, of New Decatur, Alabama, held on the 19th ult., Mr. Charles Forbes, formerly of Chattanooga, Tenn., was appointed Superintendent to fill the vacancy caused by the death of Mr. James F. Rodgers. Mr. Forbes has for the past three years held the position of foreman, under his father, at Chattanooga.

THE following circular, issued by the proprietors of the Cincinnati Gas Light and Coke Company, under date of the 2d inst., specifies the manner in which the increase in the Company's capital is to be made:

"The stockholders of the Cincinnati Gas Light and Coke Company, at a meeting held on the 1st inst., authorized an increase of $500,000 in the capital stock of said Company, for the purpose of defraying the expenses of increasing the manufacturing and distributing capacity of the Company and paying for additional mains. The Board of Directors has this day ordered the issuance of said stock and its distribution to

stockholders in ratio to their respective interests of record June 15, 1893; deliverable on paying par for same on the 1st day of July, 1893, or within 10 days thereafter, interest to be added on all payments delayed beyond July 2d. The transfer books will be closed June 15th to 30th, both days inclusive. For each share of stock standing in your name on said 15th day of June you will be entitled to receive at par $7.14 of the new stock (being in the ratio of one share for each 14 shares held on that date), which will be issued in even sums of $100, or multiples thereof, thereafter to carry all the rights and privileges of the present stock of the Company. For fractional shares no scrip certificates will be issued, but in lieu thereof cash payments will be made therefor on the 1st and 2d days of July, at the assumed market rate of $200 per share. The fractional shares thus acquired to be converted into full shares, sold in the open market, and the proceeds reconveyed into the treasury of the Company for the equal benefit of all the stockholders. About the 20th of June another notice will be issued, stating the amount of cash required from each shareholder, also number of shares or amount of check returnable."

MR. GEORGE BECK, General Manager and Superintendent of the Alton (Ills.) Gas and Electric Light Company, writing to us under date of 5th inst., says: "The city of Alton is enjoying a lively boom, and the gas business is getting its share. The demand for stoves is very good, and we are doing a better business in that line than ever before. I have been putting down mains in new territory, with good results, and expect to be busy in that respect all summer. I inclose you a small circular, used by us with excellent results." The inclosure referred to is a neat pamphlet, containing 16 pages of matter in small type respecting the advantages of gas as a cooking, heating and power agent. Several illustrations of gas stoves are spread on the pages of the pamphlet, and, take it all in all, the little volume is sure to spread the light of gas cooking logic in cheery, bustling Alton. From a list of those who are already using gas for purposes other than illumination there, we learn that 105 persons and families are now on the Company's books as users of cooking appliances, and that in 12 households gas is used for heating the rooms.

MR. C. E. BURROWS, Secretary and Superintendent of the Walla Walla (Wash.) Gas and Electric Company, writing to the JOURNAL under date of the 1st inst., says: "It may interest you to know that the first long distance power transmission, synchronizing system, to be introduced in the Far West, has just been installed for this Company. The plant consists of an A 100 T.-H. generator and a motor of the same size (2,000 volts). A novel feature is the use of one set of wires for the starting motor and generator, instead of one set for each; and it works quite successfully. The distance from water station is 5 miles. The motor is used to drive the dynamos in the old station, so we always have the steam plant to fall back on in case of accident."

THE gasoline lamp lighting contract on public account at Minneapolis, Minn., has been awarded to Mr. A. J. Boardman, at the low rate of $12.98 per lamp. The agreement is to last for 5 years.

AT the annual meeting of the Cincinnati Gas Light and Coke Company the following Directors were chosen: Messrs. A. Hickenlooper, Robert Allison, Wm. A. Goodman, A. H. Hinkle, J. H. Bates, L. C. Weir and S. J. Broadwell.

IN the meantime, just to show how closely the gas and electric lighting interests of Cincinnati are allied, the names of the Directors in the "several" electric companies of the city are appended: *Hauss Electric Light Company.*—A. Hickenlooper, L. C. Weir, W. A. Goodman, E. W. Brookfield, N. G. Kenan, H. W. Sage and William P. Wiltse. *Brush Electric Light Company.*—A. Hickenlooper, Wm. A. Goodman, Lew C. Weir, C. F. Hesser, Albert G. Clark, J. A. Crawford, J. H. Burkam. *First Cincinnati Edison Electric Light Company.*—A. Hickenlooper, Wm. A Goodman, Lew C. Weir, Norman G. Kenan, C. F. Hesser, E. N. Roth and H. W. Darling.

MR. F. C. AYER has resigned his position with the Northampton (Mass.) Gas Company, and will return to England.

MR. T. G. LANSDEN, the capable Engineer of the Washington (D. C.) Gas Light Company, was in New York recently, en route for St. Louis. His leave of absence has been so adapted that he will, of course, be enabled to join with the Western Association in its deliberations. In the early days of the Western no one was more indefatigable in his efforts to advance its best interests, a work of duty and friendship that the Association subsequently recognized by electing him to the Presidency.

IT is said that the Ohio Legislature has empowered the authorities of Piqua to issue bonds to the amount of $30,000, for the purpose of "prospecting for natural gas, drilling wells and laying gas pipes to distribute fuel to consumers." The Piqua *Leader*, in commenting on this proposed step, says: "It seems to us that this is an enterprise into which the city should very slowly and carefully enter, if it should go into it at all. Municipal investments in gas plants haven't proven very satisfactory."

IT is said that Appleton, Wis., may soon have a strictly fuel gas plant; but we fail to discover the burning need that exists there for such an enterprise.

AT the annual meeting of the Westerly (R. I.) Gas and Electric Light Company the following officers were chosen: Directors, Edwin Babcock, Peleg Clark, George H. Utter, A. L. Chester and Wm. Segar; President, A. L. Chester; Secretary, Treasurer and General Manager, William Segar.

THE estate of Nathaniel Tufts, of Boston, Mass., is to be warmly congratulated on having secured for the management of its gas meter manufacturing business such an excellent man as Mr. Charles W. Hinman, whose record for many years, in the service of the State of Massachusetts as its official Inspector of Gas and Gas Meters, was that of an expert of undoubted ability and a man of the highest probity. It is true the State loses the services of a man that it will find difficult to replace, but as the niggardliness of the State is largely at fault for his action, no great pity will go out to the body politic over Mr. Hinman's withdrawal from its service. On the other hand, however, none will forget that the State's loss is the Tuft estate's gain. On assuming charge of his new duties, Manager Hinman, on the 8th inst., gave out the following circular: "The business of manufacturing gas meters, lanterns, etc., formerly carried on by Nathaniel Tufts and later by his son, N. W. S. Tufts, has been reorganized with Charles W. Hinman as Manager. It will be the aim of the present management to maintain the high standard of excellence attained by the late Nathaniel Tufts, and to introduce improvements wherever possible. This will be the easier accomplished as practically all the skilled workmen employed by the late Nathaniel Tufts are now in the employ of the present management. Great care will be taken in inspecting all parts of the work, so that no imperfect meters, or other articles, may leave the establishment. A sufficient stock of the various sizes of meters will be kept on hand to enable all ordinary orders to be promptly filled. Mr. Hinman's experience of more than 20 years in testing gas and gas meters will be utilized in the design and construction of improved photometers, meter provers, pressure gauges, apparatus for the chemical testing of gas, and also other experimental apparatus."

AT the annual meeting of the Westinghouse Fuel Gas and Manufacturing Company the following Directors were elected: George Westinghouse, Jr., Lemuel Bannister, John Caldwell, Robert Pitcairn, H. H. Westinghouse, J. R. McGinley and A. L. McKaig.

THE proprietors of the Niagara Falls (N. Y.) Gas Company will expend $20,000 in betterments this season.

MESSRS. BARTLETT, HAYWARD & CO., of Baltimore, Md., have agreed to construct for the Chicago Gas Light and Coke Company two new holders, each to be a duplicate of the holder completed for the same Company in 1892, an illustrated description of which will be found on our current pages. Besides these contracts, Messrs. Bartlett, Hayward & Co. have now on their books orders for seven holders, to be erected at as many different points. All of which goes to show that the gas business is in a positively flourishing condition.

ARTICLE 8 of a call for a meeting of the authorities of North Adams, Mass., was framed for the purpose of determining whether or not the district would vote to authorize the Prudential Committee to make a contract with the North Adams Gas Light Company, or any person or corporation for lighting the streets with arc electric, gas and oil lamps, for one or more years. Mr. Thayer moved that the Prudential Committee be authorized to make a contract with the North Adams Gas Light Company, but neglecting to put in the words "or any other corporation or person," Mr. Dowlin moved as an amendment to the motion that they be included. Mr. Couch asked Mr. Dowlin to state what other companies these were, and added, "If there were none, there was no use taking up time in that manner." Mr. Richardson (of the Gas Company) stated he had no objection to the amendment, whereupon Mr. Bracewell asked for some information concerning the price of the arc

lights, to which Mr. Richardson made answer that there was but one city in New England (Springfield) that had cheaper lights than North Adams, and the authorities of Springfield owned the poles. There was nothing in the proposed price that would not bear examination, and so he (Mr. Richardson) had no objection to the amendment offered by Mr. Dowlin, and was willing to reply to any queries that might be put forth. Dr. O. J. Brown remarked that his calling often obliged him to be out at very early hours of the morning, and he frequently met many people going to the work in the dark. Mr. Richardson replied to this by saying that such conditions were the result of accident, not design or negligence. Mr. Dowlin's amendment was then rejected and the motion of Mr. Thayer was carried.

At the annual meeting of the shareholders in the Erie (Pa.) Gas Company the following Directors were chosen: C. M. Reed, Wm. Spencer, G. R. Metcalf, Capt. J. S. Richards, W. H. Nicholson, W. S. Brown and Dr. Chas. Brandes. The Directors subsequently organized the Board by naming the following executives: President, Chas. M. Reed; Treasurer, George R. Metcalf; Secretary, Paul Mueller.

John Mack has brought suit, in the Suffolk County Superior Court, against the Boston Gas Light Company, in the shape of an action in tort to recover $1,000 damages to property. Plaintiff alleges that on December 8, 1891, an explosion occurred which was due to an escape of gas from defendant's pipes, and that by reason of said explosion his house at Chapman place was seriously damaged. A verdict was rendered for the defendant. Mr. C. P. Greenough appeared for the Company, plaintiff being represented by Mr. A. B. Wentworth.

The Supreme Court of Pennsylvania, sitting in Philadelphia, dismissed the appeal in the case of Stewart Brown and others against the Equitable (natural) Gas Company, of Pittsburgh. Brown & Co. had a contract for a supply of natural gas from the Company, the service to be performed at a stipulated rate, but before the expiration of the contract the Company raised the price. Brown & Co. held that this was a violation of the agreement, and refused to pay the difference demanded, whereupon the gas was shut off from their works on 10th street. The case was carried into the Allegheny county courts, where decisions sustaining the Company were rendered—the Company alleged that the contract was vitiated through the wasteful manner in which the gas was used by Messrs. Brown & Co. The Supreme Court held that it did not have to consider any question except whether the lower Court did right in refusing an injunction, and ordered a decree for the Company.

A correspondent at Chicago forwards the following: "A curious accident occurred a few days ago in the engine room of the station of the Chicago Illuminating Company, 31st street, Chicago. Early in the evening, as Engineer Jefferson L. Waters was stepping out of the door of the engine room, the six-foot flywheel burst, tearing off the roof of the dynamo house and demolishing the front wall of the engine room. Pieces of the wheel were hurled across an alleyway that separates the electric plant from the house of a man named Wendel, landing in the kitchen thereof, and wrecking things generally—the Wendel family, luckily, were in the dining room at the time. The shock jarred the houses for several blocks in the vicinity; windows were broken in the houses nearby, and all the lamps were extinguished in the district bounded by 29th and 35th streets, Wentworth avenue and the Lake. At the time the wheel burst there were three men in the engine room, Messrs. Waters, Brown and Waters, and the escape of these men without injury is little short of wonderful, for the room was badly shattered. It took several days to put the plant in working order, and the damage amounted to perhaps $5,000."

Following the agitation by the city authorities of an attempt to order the Portland (Me.) Gas Light Company—the city owns a good block of stock in the Company—to declare a special dividend, in addition to the regular return, came the decision of the Directors not to recommend such a course. The Directors admitted that funds sufficient to pay such a dividend were in hand, but they declared that the sensible management of the works pointed to the need of making important plant extensions, and that such betterments would absorb a large part of the surplus. Good for the Directors.

The Rockville, Conn., gas plant will be enlarged by the construction of a gasholder rated to store 100,000 cubic feet.

At the annual meeting of the United Gas Improvement Company the following officers were chosen: President, Thomas Dolan; First Vice-President, George Philler; Second Vice-President and General Manager, Samuel J. Bodine; Third Vice-President, Randal Morgan; Secretary and Treasurer, Edward C. Lee; General Superintendent, Alexander C. Humphreys; Assistant General Superintendent, Walton Clark; Directors, George Philler, William G. Warden, P. A. B. Widener, William L. Elkins, William W. Gibbs and Clement A. Griscom.

The election of Directors in the Bethlehem (Pa.) Gas Company terminated in the choice of the following: A. H. Rauch, H. B. Luckenbach, Simon Rau, J. S. Krause, J. M. Leibert, John Walp, A. C. Borhek, F. E. Luckenbach and C. H. Eggert.

The Mutual Fuel Gas Company, of Hyde Park, Chicago, has certified to the fact that its capital stock has been increased to $5,000,000.

The City Gas Board, of Wheeling, West Va., who now have under their charge an electric lighting plant as well as a gas works, report that the cost to the city for each arc during the year was $59.30. This does not include anything chargeable to depreciation—in fact, it is the bare cost of furnishing the lights.

Mr. Howard M. Lane, the courteous manager of the Leominster (Mass.) Gas Company, is in high feather over the office headquarters, which have just been put in the best possible shape.

Mr. William F. Conant has been appointed Chief Clerk to the Electric Lighting Commission of Detroit.

At the annual meeting of the Bangor (Me.) Gas Company the following result was reached: Directors, T. U. Coe, C. P. Stetson, J. F. Colby, F. A. Wilson and Willard Cutter; President, T. U. Coe; Clerk, Henry Boardman; Treasurer, George A. Crosby; Superintendent, A. H. Parker.

At the annual meeting of the Easton (Pa.) Gas Company, Messrs. Samuel Boileau, William A. Seitz and R. I. Jones, were elected Directors, to serve for a term of three years. The Directors subsequently named the following officers: President, Samuel Boileau; Secretary, William G. Stewart; Treasurer, E. S. Lawall; Superintendent, William H. Ward.

Stoppage of Chemical Action at Low Temperature.

From the results, recently published, of some investigations carried out by Pictet on the effect of low temperatures on chemical action, it would seem that there is a limiting temperature below which chemical affinity is not operative. Just as, at the other end of the scale, chemical compounds are broken up, their union being dissolved through the operation of dissociation, so, when the temperature falls below a certain point, substances which ordinarily evince a powerful affinity for each other become entirely inactive. From theoretical considerations, he had deduced the conclusion that chemical action should be impossible under these conditions, and his experiments show this to be the case. For example, slightly diluted sulphuric acid, solidifying at —56°, was intimately mixed at —125° with finely powdered caustic soda, and the mixture strongly compressed, but there was no sign of chemical action. On allowing the temperature to rise to —80°, action suddenly commenced, and became so violent that the containing vessel was broken. Similar results were obtained with sulphuric acid and potash.

Concentrated ammonia solution and sulphuric acid are without action on one another at —80°, but complete action suddenly sets in at from —60° to —65°. Common salt and sulphuric acid do not react at —50°, nor is there much action until the temperature reaches —25°. Moderately dilute sulphuric acid does not attack carbonates at —80°. Bubbles of gas begin to appear between —60° and 50°, but brisk effervescence does not set in until the temperature has reached —30° or upward. Similar results were obtained with nitric in place of sulphuric acid, but the temperature at which action commenced was rather lower in each case.

Even the very sensitive vegetable colors are not affected at very low temperatures. Thus the litmus is not reddened by sulphuric or hydrochloric acid at —120°, and alcoholic potash does not give a coloration with phenolphthalein at —135°. From these and similar experiments, Pictet concludes that chemical reaction cannot occur between —125° and —150°.

The Market for Gas Securities.

The market for city gas shares showed some improvement during the week, but prices for Consolidated are abnormally low. The opening to-day (Friday) was made at 116½, and the indications were that better figures would rule. The stock is very, very cheap at anything under 125. Equitable and Mutual show no particular change. At the annual meeting of the Standard Gas Company the following officials were chosen: Directors, Chas. Dana, Russell Sage, John T. Terry, D. H. McAlpin, Frank Tilford, Oliver S. Carter, E. V. Loew, H. H. Brockway and Ferd. McKeige; President, Chas. Dana; Vice President, Russell Sage; Secretary and Treasurer, Ferd. McKeige. The Company will make important plant improvements this season.

Brooklyn shares are low and very erratic, and the situation there shows no particular change, although the consolidation proceedings are undoubtedly making headway. Chicago gas is at 72¾ to 73, Baltimore Consolidated is offered at 63, and Bay State is reported at 23½ to 24. We note the sale at auction of 63 shares Williamsburgh, at 130, and 25 shares of Metropolitan, of Brooklyn, at 114—quite a drop from the Addicks purchase rate.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

May 15.

☞ All communications will receive particular attention. ☜
The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	116½	116¾
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	192	195
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	140	145
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	38	40
Preferred	5,000,000	100	85	90
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	120
Citizens	1,200,000	20	107½	108½
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co	2,000,000	100	45	—
Bonds	1,000,000	—	—	65
Fulton Municipal	3,000,000	100	135	140
" Bonds	300,000		102	—
Peoples	1,000,000	10	90	95
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	120	130
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	150	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	130	140
" Bonds	1,000,000	—	107	110

Proposals for Coal Tar.

The Nashville (Tenn.) Gas Light Company proposes to sell one year's output of Coal Tar, beginning on July 1, 1893. The amount of same will be about four thousand (4,000) barrels. Bids for same are solicited.

NASHVILLE GAS LIGHT COMPANY,
935-2 Nashville, Tenn.

SERVICES FOR SALE,

As Superintendent or Manager of Gas Company.

A young man with first-class technical education, and a chemist, with best of references; acquainted with coal and water gas; five years' experience from office to retort house, as Superintendent of a small Gas Company. Change of location desired to a larger field. Address
936-tf "I. A. C., care this Journal

WANTED,

An Expert Meter Repairer.

To a thoroughly efficient man good wages will be paid. Apply, with testimonials, to

SUPERINTENDENT ALTOONA GAS CO.,
936-2 Altoona, Pa.

WANTED,

By a Gas Meter Maker,

A Situation in a Gas Works.

Best of references given. Address "METER MAKER,"
935-2 Care this Journal.

Young man at present in charge of a Coal Gas Plant, the output of which was 75 millions last year, desires a

Position as Superintendent of a Gas Company

in a Western or Southwestern city, where the chances for future development are good. Has had experience with water gas. Best of recommendations from officials of company in which he is at present employed. Address
934-3 "X.," care this Journal.

Position Wanted

As Superintendent of Gas Works,

by a man fully competent in every respect, and who has had 20 years' experience. Or **would Lease a Small Works.**
930-tf Address "J.," care this Journal.

Position Wanted

AS SUPERINTENDENT, ENGINEER, OR ASST. ENGINEER OF GAS WORKS,

by a good, reliable man, who is a first-class draughtsman, familiar with the construction of all kinds of Coal and Water Gas Apparatus. Best of references. Address "A. B. C."
933-4 Care this Office.

WANTED,

Three or Four Purifying Boxes,

Not less than 8 feet square.

Address CAPITAL GAS AND ELECTRIC LT. CO.,
935-6 Frankfort, Ky.

WANTED,

Two Second-Hand Purifying Boxes, 4 x 4 ft.

Address ALEXANDER SMITH, Supt.,
934-3 Frostburg Gas Lt. Co., Frostburg, Md.

FOR SALE.

A Six-Inch Connelly Governor.

In perfect order; used only a short time.

Address P. O. Box No. 3582,
935-2 Boston, Mass.

FOR SALE,

One Hundred (100) Barrels Strictly Pure Coal Tar.

Address LAMBERTVILLE GAS LT. CO.,
935-2 Lambertville, N. J.

FOR SALE,

Two Ten-Inch Dry Center Seals,

in good condition, and one

Small Multitubular Condenser,

4 ft. diameter and 14 ft high.

For particulars inquire of FRED. BREDEL, C.E.,
929-tf 118 Farwell Ave., Milwaukee, Wis.

FOR SALE,

Two Westinghouse Engines, of 12 H.P. each.

Ten 12-inch Chapman Valves.

All in good order. Address NEW HAVEN GAS LT. CO.,
922-tf New Haven, Conn.

For Sale.

One Exhauster, 10-in. Connections and Bye-Pass Valves; also Pressure Governor attached.

Two Small New York Safety Engines.

One Small Upright Boiler, for making Steam for Exhauster.

One Hydraulic Main, with 6-in. Connections, for five benches of 5's, with 10-in. Outlet Connection.

One Hydraulic Main, with 4-in. Connections for four benches of 3's, with 4-in. Outlet Connections.

Four Purifiers, 10 x 12 x 3 ft. 15-in. Seal and 10-in. Connections. Dry Center Seal.

60-inch Station Meter and Stand (American Meter Co.); 8-in. Connections.

One Multituber Condenser, 16 x 4 x 4 in. Pipes. 10-in. Connections, with four-way Valves on Connections.

Two Scrubbers, 4½ x 4½ x 12 ft., with 10-in. Connections and four-way Valves on Connections.

Seven New Mouthpieces for 5's. Also,

Tools for Retorts, and **Connections** for five benches of 5's and four benches of 3's, with **Mouthpieces** for same.

For full particulars address DELA. COUNTY GAS CO.,
935-2 Chester, Pa.

A GOOD, SAFE INVESTMENT.

FOR SALE—Consolidated Gas and Electric Light Plants,

doing a good business in the best town in Southwest Missouri. For further particulars address Lock Box 593,
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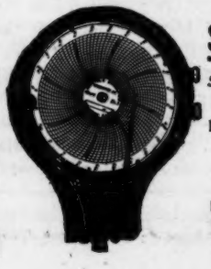

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